Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
Establishing the Digital Opportunity Data Collection	)	WC Docket No. 19-195

COMMENTS OF T-MOBILE USA, INC.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Broadband DATA Act directs the Commission to develop new mobile wireless coverage maps as well as processes to challenge and validate the maps. The Commission has adopted rules for new coverage maps and set forth certain parameters for the challenge process, requests for verification information, and the collection of crowdsourced data. The Commission has also directed the Wireless Telecommunications Bureau ("WTB"), the Office of Economics and Analytics ("OEA"), and the Office of Engineering and Technology ("OET") (collectively, the "Bureaus") to seek comment on the details for these processes. The Commission recently sought comment on the methodology for the mobile challenge process, requests for verification information, and the collection and use of crowdsourced data. T-Mobile supports many aspects of the framework but recommends the following adjustments to ensure that the processes meet Congress's goals of improving the accuracy of maps while minimizing unnecessary burdens on challengers and providers.

Methodology of the Challenge Process. T-Mobile supports the use of the open-source H3 geospatial indexing system but encourages the Commission to confine the challenge process to smaller geographic units (resolution 10 hexagonal cells rather than resolution 8 hexagonal cells) to better match the 100 meter resolution of providers' maps. This approach better aligns with the Broadband DATA Act by helping to ensure coverage maps are as precise as possible. Using too large of a graphic area risks removing areas from coverage maps that are in fact served, resulting in less accurate maps.

Scope of the Challenge Process. The challenge process should be limited to outdoor stationary maps of 4G LTE and 5G-NR coverage. T-Mobile supports the proposed exclusion of voice maps from the challenge process, and the Commission should similarly exclude maps of 3G coverage because providers are in the process of retiring their 3G networks. A challenge

process aimed at refining 3G maps would be of limited utility. In addition, as T-Mobile has previously explained, the Commission should reconsider its decision to require submission of any in-vehicle coverage maps as part of the Broadband Data Collection ("BDC"), but in any case, the Commission should not include these maps in the challenge process because it has yet to set any parameters for in-vehicle coverage mapping or for evaluating in-vehicle challenges.

Process for Cognizable Challenges. T-Mobile supports the use of temporal, geographic, and numerical thresholds for challenges but recommends certain refinements to ensure that these thresholds are set at the optimal levels. For the temporal and geographic thresholds, T-Mobile supports the Public Notice's proposal to require at least two tests be conducted four hours apart and to require tests to be taken within areas of a given hexagonal cell that a provider reports as having coverage. For the numerical threshold, T-Mobile recommends that the Commission require challengers to submit a minimum of 5 tests for each resolution 10 hexagonal cell, and that at least 50% of these tests are negative.

Because the Commission will rely on the results of speed test applications to determine whether a given challenge is meritorious, the Commission must ensure that these applications are vetted, robust, and reliable. T-Mobile supports the proposal for OET to seek comment before approving any third-party speed test applications for use in the challenge process, and T-Mobile recommends that the same process and standards apply to the FCC Speed Test application as well. As part of evaluating whether a given application is sufficiently reliable, any speed test application (including the FCC Speed Test application) should be required to comply with certain standards and collect the following metrics. Specifically, T-Mobile recommends that all speed test applications used for the challenge process be required to use a minimum of 50 servers geographically spread out across the country to ensure accurate test results. Speed test

applications should also have sufficient functionality so that a challenger cannot submit test data from a location that a provider does not report as being served.

Finally, T-Mobile supports the proposal to "batch" challenges monthly to avoid the burden of unpredictable challenges while ensuring that challenges are resolved in a timely way and that providers can plan accordingly.

Provider Responses to Cognizable Challenges. Consistent with the Commission's findings in the *Third Report and Order*, providers must have flexibility to determine how to respond, if at all, to cognizable challenges. For example, mobile wireless providers should have the option to submit (1) test results from any Commission-approved speed test application, (2) data from field tests conducted in the ordinary course of business or pursuant to other obligations or commitments, (3) data collected through a provider's own software tools (including data from transmitter monitoring software), (4) targeted infrastructure information, or (5) other information demonstrating that a test is invalid due to a device issue (*e.g.*, that test devices were not capable of receiving the technology or spectrum bands or the service plan exceeded its data allowance) or that test results were caused by other network issues, such as a temporary outage.

Targeting Verification Requests. The Commission should limit the number and scope of verification requests to mitigate the burdens on providers and avoid redundant verification. For example, the Commission should limit any requested infrastructure information to the smallest coverage area necessary, and these requests should be focused on more rural areas where verification requests may be more useful for public policy purposes, such as identifying unserved areas. To minimize burdens and avoid redundancy, the Commission should exempt providers from these verification requests if they are already subject to mandatory drive-testing. Finally, T-Mobile strongly opposes any collection of highly sensitive infrastructure information for staff

to create its own alternative models of providers' coverage. Not only will staff fail to replicate the sophisticated and expensive model T-Mobile uses, but this undertaking is completely unnecessary given the availability of the challenge process and the variety of validation and verification tools required by the BDC.

Crowdsourced Data. T-Mobile supports the Commission's use of crowdsourced data and recommends that the "critical mass" standard be used for other verification processes as well. T-Mobile also supports the proposal to hold government entities and third parties' test data to the same metrics and parameters as mobile providers.

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T-Mobile USA, Inc. ("T-Mobile")[1] submits these comments in response to the Wireless Telecommunications Bureau ("WTB"), the Office of Economics and Analytics ("OEA"), and the Office of Engineering and Technology ("OET") (collectively, the "Bureaus") Public Notice seeking comment on the Broadband Data Collection's ("BDC") mobile challenge, verification, and crowdsource processes.[2]

I. INTRODUCTION

T-Mobile supports the Commission's efforts to develop more accurate and granular coverage maps as required by the Broadband DATA Act. Although the Commission has not yet implemented the BDC, T-Mobile voluntarily submitted maps of its nationwide 4G LTE coverage pursuant to the new requirement as specified by Congress.[3]

[1] T-Mobile USA, Inc. is a wholly-owned subsidiary of T-Mobile US, Inc., a publicly traded company. T-Mobile and Sprint are now one company operating under the name "T-Mobile." The merger closed on April 1, 2020.

[2] *Comment Sought on Technical Requirements for the Mobile Challenge, Verification, and Crowdsource Processes Required under the Broadband DATA Act*, Public Notice, WC Docket No. 19-195, DA 21-853 (WTB, OEA, & OET rel. July 16, 2021) ("Public Notice").

[3] Available at https://fcc.maps.arcgis.com/apps/webappviewer/index.html?id=6c1b2e73d9d749cdb7bc88a0d1bdd25b.

The Broadband DATA Act requires the Commission to adopt a "user-friendly" challenge process to ensure coverage maps are as accurate as possible,[4] but it also requires the Commission to consider "the need to mitigate the time and expense incurred by, and the administrative burdens placed on" both individual challengers and providers "responding to challenges."[5] As explained below, T-Mobile supports many aspects of the proposed challenge process, but recommends certain adjustments to ensure the processes heed Congress's direction to help refine the accuracy of coverage maps while minimizing the burdens, time, and expense on challengers and providers.

II. THE CHALLENGE PROCESS SHOULD ALIGN WITH PROVIDERS' COVERAGE MAPS AND BE LIMITED TO OUTDOOR STATIONARY 4G AND 5G-NR MAPS.

The Public Notice proposes to aggregate speed-test data from all challengers in a given area; filter out speed tests that do not meet certain temporal, geographic, and numerical criteria; and then determine whether coverage is presumptively unavailable based on a specified number of "negative" speed tests.[6] Mobile wireless providers would then have an opportunity to respond using their own speed-test data or data from other sources showing that coverage is available. This provides a reasonable foundation for an effective and efficient process for correcting coverage maps, but T-Mobile recommends two refinements to ensure a successful challenge process.

First, the challenge process should focus on smaller geographic units that match more closely the resolution of mobile wireless providers' maps. The H3 geospatial indexing system is a reasonable approach, but T-Mobile recommends that the Commission use resolution 10

[4] 47 U.S.C. § 642(b)(5)(A).

[5] *Id.* § 642(b)(5)(B)(i)(III).

[6] Public Notice, Appendix, at 35-40.

hexagonal cells as the minimum geographic unit for challenges. In addition, the Commission should not remove lower resolution cells (*e.g.*, resolution 8 or resolution 7) based on successful challenges to higher resolution cells (*e.g.*, resolution 10). This approach will allow the challenge process to make coverage maps more accurate without increasing the burdens on consumers.

Second, the mobile challenge process should be limited to outdoor stationary maps of 4G LTE and 5G coverage, excluding 3G and in-vehicle coverage maps.

A. The Minimum Geographic Areas for the Challenge Process Should Match the Resolution of Providers' Maps to the Extent Feasible.

The Public Notice proposes to use the H3 geospatial indexing system to organize speed tests into discrete geographic areas.[7] The H3 indexing system works by plotting nesting hexagons of different sizes onto a map of the country. T-Mobile believes that the H3 indexing system is a reasonable solution overall because it is an open-source platform that allows stakeholders to use a common framework for assessing the accuracy of coverage data. At the same time, using hexagons for the challenge process when providers' maps use 100 meter by 100 meter squares[8] inevitably creates a mismatch and introduces some complexity and introduces some degree of inaccuracy and imprecision.[9]

To minimize the gap between providers' maps and the geographic units for the challenge process, T-Mobile recommends that the minimum geographic units used for the challenge process be smaller than the resolution proposed by the Commission. Specifically, T-Mobile

[7] Public Notice ¶ 10.

[8] The Commission's rules provide that "the provider's coverage maps must account for terrain and clutter and use terrain and clutter data with a resolution of 100 meters or better. Each coverage map must have a resolution of 100 meters or better." 47 C.F.R. § 1.7004(c)(3)(iii).

[9] Public Notice ¶ 10.

recommends that the challenge process be based on resolution 10 hexagonal ("hex-10") cells rather than resolution 8 hexagonal ("hex-8") cells.[10]

Hex-8 cells cover an area of approximately 737,000 square meters, and they contain seven resolution 9 hexagonal ("hex-9") cells covering 105,000 square meters.[11] Hex-10 cells, by contrast, are only 15,000 square meters, compared to providers' cells that cover 10,000 square meters. Under the proposal in the Public Notice, challengers would have to submit a sufficient number of negative tests in a sufficient number of hex-9 cells to sustain a challenge to a given hex-8 cell, though the thresholds would vary depending on how many of these "child" hex-9 cells are accessible to challengers.[12]

T-Mobile appreciates the Commission's efforts to design the challenge process in a way that will be user friendly,[13] but, as proposed, it could have unintended consequences and introduce distortions and inaccuracies in the maps. A hex-8 cell is nearly 75 times larger than the 100 square-meter cells that providers are required to model, and hex-9 cells are over 10 times the size. By contrast, hex-10 cells are only about 50% larger than providers' required 100 meter squares.

[10] *Id.*, Appendix at 35-36.

[11] *Id.*, Appendix at 33-35.

[12] *Id.*, Appendix at 35.

[13] *Id.*, Appendix at 35-36.

H3 Resolution	Average Area (square meters)	Average Edge Length (meters)
5	252,903,000	8,544
6	36,129,000	3,229
7	5,161,000	1,221
8	737,000	461
9	105,000	174
10	15,000	66
FCC Required Coverage Maps	10,000	100

To show how these differences translate into coverage maps, the diagram below shows a provider's 100 meter by 100 meter square (in green) compared to the hex-8 and hex-9 cells.

As the diagram shows, a hex-8 cell is too large to serve as the minimum geographic unit for the challenge process. In hex-8 cells where partial coverage is available (*e.g.*, areas with strong coverage in certain hex-9 cells but weaker or no coverage in others), the coverage maps could end up indicating that no coverage is available at all in the hex-8 cell. Understating coverage in an area does not help to refine maps, nor does it help consumers or the Commission to understate where coverage is available in an area.

T-Mobile thus recommends that the Commission use hex-10 cells as the geographic unit for the challenge process. Adopting T-Mobile's recommendation will also help minimize a potential domino effect from nesting. The Public Notice proposes to use a nested structure so that successful challenges to hex-8 cells could automatically trigger the removal of larger hex-7 and hex-6 cells.[14] These cells are up to 36 square kilometers on average—or more than 3,600 times the size of a provider's minimum cells. If hex-8 cells with partial coverage are clustered together, this could result in the maps showing very large areas with no coverage when there is in fact a significant amount of coverage available.

At a minimum, if the Commission bases the challenge process on hex-8 cells, it should not automatically remove hex-7 or hex-6 cells—or any coarser resolution cells if a more granular resolution is ultimately adopted—based on successful challenges to a subset of hex-8 child cells. Instead, the Commission should only remove those hex-8 cells that have been shown to lack the coverage represented on a provider's map. If the Commission believes the hex-8 is the appropriate geographic unit, another way to resolve concerns about the inaccuracies of the challenge process would be for the Commission to reconsider its rules regarding the resolution of providers' maps to make sure there is alignment.

[14] *Id.*, Appendix at 41-42.

Finally, if the Commission decides to use the H3 indexing system for the challenge process, it should consider permitting carriers to submit their underlying coverage data in the H3 format at resolution 10 or greater for BDC. This is consistent with the Commission's rule that providers must submit coverage data with a resolution of 100 meters or better,[15] since the edge length of a resolution 10 hexagonal cell is approximately 66 meters, with higher resolution cells using shorter edge lengths. Using a single, uniform, grid system for both the coverage maps and challenge process—somewhat akin to a wireless location "fabric"—would ensure that every wireless carrier's coverage map would have the same grid structure for consumers to review. It would also simplify the challenge process by removing the challenge of trying to compare hexagons and squares.

B. The Challenge Process Should Be Limited to Outdoor Stationary 4G LTE and 5G Coverage Maps.

The Commission should adopt a challenge process that furthers public policy goals and complies with the Broadband DATA Act but avoids introducing unnecessary complexity to the challenge process. The Public Notice proposes to exclude challenges to voice coverage maps,[16] and T-Mobile supports this proposal to permit challenges to 4G LTE and 5G. For similar reasons, the Commission should also exclude 3G and in-vehicle coverage challenges, limiting the process to only outdoor stationary 4G LTE and 5G coverage while this novel challenge process is started.

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[15] 47 C.F.R. § 1.7004(c)(3)(iii).

[16] *See* Public Notice ¶ 9 ("[B]ecause we do not believe there is a reliable way to evaluate mobile voice coverage using the speed test data which the Commission requires for submitting challenges, we propose not to permit challenges to the voice coverage maps submitted by mobile service providers." (footnote omitted)). T-Mobile supports the proposal to exclude voice coverage maps from the challenge process.

3G Coverage Maps. The Commission should not permit challenges to 3G coverage maps. As a practical matter, T-Mobile and other large mobile providers have announced plans to decommission their 3G networks to focus on 5G deployment. T-Mobile is in the process of sunsetting its 3G network to make room for sufficient 4G and 5G capacity as well as coverage to support all of its customers;[17] AT&T similarly plans to retire its 3G network in February 2022;[18] and Verizon announced plans to shut off its 3G network by the end of 2022.[19] It makes no sense to allow challenges to maps that are in the process of being retired, nor would it be a good use of provider or Commission resources. Because the technology is being decommissioned, coverage will likely be smaller than the snapshot in time used to create the 3G maps.

Congress directed the Commission to develop maps showing mobile providers' 4G LTE coverage or better, and it did not direct the Commission to collect coverage data on 3G networks or to establish a challenge process for 3G coverage data.[20] And for good reason, the Commission should not be using 3G coverage data to target support for any federal subsidies, including the 5G Fund, further demonstrating the limited usefulness of such information.[21] Adjudicating challenges and requiring providers to update the 3G maps would also be inconsistent with Congressional direction for the Commission to consider the "time and expense" associated with

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[17] Press Release, Mike Sievert, T-Mobile US, *For T-Mobile — 5G Connectivity Means that No One is Left Behind* (Aug. 9, 2021), https://investor.t-mobile.com/news-and-events/t-mobile-us-press-releases/press-release-details/2021/For-TMobile--5G-Connectivity-Means-that-No-One-is-Left-Behind/default.aspx.

[18] *Act Now - 3G is Going Away in 2022*, AT&T, https://www.att.com/support/article/wireless/KM1324171/ (last updated July 30, 2021).

[19] Mike Haberman, *3G CDMA Network Shut Off Date set for December 31, 2022*, Verizon (Mar. 30, 2021), https://www.verizon.com/about/news/3g-cdma-network-shut-date-set-december-31-2022.

[20] 47 U.S.C. § 642(b)(2)(B) (discussing 4G LTE).

[21] *See In re Establishing a 5G Fund for Rural America*, Report and Order, 35 FCC Rcd 12174, 12181-82 ¶¶ 17-18 (2020) ("We will determine the areas eligible for support in the 5G Fund Phase I auction based upon where new mobile coverage data submitted in the Digital Opportunity Data Collection show a lack of unsubsidized 4G LTE and 5G broadband service by at least one service provider. . . .We likewise decline to prioritize any areas based upon historical 3G and 4G LTE coverage data.").

responding to challenges.[22] The Commission should therefore limit the challenge process to 4G LTE and 5G maps.

In-Vehicle Mobile Coverage Maps. The Commission should also limit the challenge process to outdoor stationary coverage maps. There is no reason to require submission of in-vehicle coverage data, and T-Mobile continues to support CTIA's pending petition for reconsideration requiring providers to submit in-vehicle coverage maps.[23] Outdoor stationary maps are more than sufficient to give consumers and the Commission an accurate picture of where mobile coverage is available. Indeed, the 4G LTE maps that T-Mobile and other major carriers recently submitted on a voluntary basis were limited to outdoor stationary coverage.[24] If the Commission declines to reconsider the submission of in-vehicle coverage maps, it should nonetheless limit the challenge process to outdoor stationary maps given the highly complicated and resource-intensive nature of administering a rigorous challenge process for in-vehicle coverage maps.[25]

As a threshold matter, the Commission has not adopted any standards for in-vehicle coverage mapping, which is necessary for providers to replicate and respond to a challenge. Due to the myriad variables at issue—especially when compared to stationary tests—in-vehicle coverage tests are very hard to recreate and evaluate. It is not possible for a provider to respond

[22] The Broadband DATA Act directs the Commission to consider "the need to mitigate the time and expense incurred by, and the administrative burdens placed on, entities . . . responding to challenges." 47 U.S.C. § 642(b)(5)(B)(i)(III).

[23] Comments and Petition for Reconsideration of CTIA, WC Docket Nos. 19-195 and 11-10 (Sept. 8, 2020) ("CTIA Recon Petition"); Comments of T-Mobile USA, Inc., WC Docket Nos. 19-195 and 11-10 (June 4, 2021) ("T-Mobile Recon Comments").

[24] *Supra* note 3.

[25] *See, e.g.*, Comments of Verizon at 10, WC Docket Nos. 19-195 and 11-10 (Sept. 8, 2020); Comments of T-Mobile USA, Inc. at 15-16, WC Docket Nos. 19-195 and 11-10 (Sept. 8, 2020); T-Mobile Recon Comments at 2; CTIA Recon Petition at 5-7.

absent defined and consistent parameters. Before any challenges to in-vehicle coverage maps can occur, the Commission must propose and seek comment on the parameters for in-vehicle coverage mapping and challenges. For example, the parameters would include basic data about the test conditions, including the speed of the test vehicle, the direction of the vehicle's travel, the time of day, number of passengers in the vehicle and their location within it, and the location of the test device within the vehicle. Guidelines would also include specific attributes about the vehicle, such as make and model, various dealer and after-market customizations, including (among other things) window tinting,[26] and certain temporary configurations (such as window and sunroof position), all of which may affect test results. All of these parameters would need to be standardized to ensure apples-to-apples comparisons, as they would also be critical data points for properly evaluating any given challenge. The Commission must defer any in-vehicle coverage testing until these steps occur or providers will be traveling blind throwing darts from vehicles. The result is not in the public interest, nor would it help improve coverage maps.

Aggregating In-Vehicle and Outdoor Stationary Speed Tests. The Public Notice proposes to aggregate in-vehicle and outdoor stationary speed-tests together, with the result that challenges could be based on a hybrid of both types of data.[27] T-Mobile opposes this proposal because aggregating separate coverage maps is a flawed methodology, and this approach could introduce confusion to the challenge process.

While the Public Notice acknowledges that the outdoor stationary and in-vehicle coverage maps are not the same, it nonetheless indicates that aggregating tests to reconcile

[26] *See, e.g.*, Bryan Murray & Amir I. Zaghloui, *Shielding Effectiveness of Tinted Automotive Films*, at 1 (July 2013), https://www.researchgate.net/publication/269330641_Shielding_effectiveness_of_tinted_automotive_films (explaining that "window tinting can significantly impact the performance of wireless devices inside a vehicle").

[27] *See* Public Notice ¶ 13.

challenges to these two sets of coverage data may be more "user-friendly."[28] But the Commission should not sacrifice accuracy and sound methodology for the sake of user-friendliness. For example, while it would be user-friendly to allow a single challenge for 4G LTE or 5G-NR coverage maps, the Commission has clearly ruled this out, and for good reason.[29] The same is true for outdoor stationary versus in-vehicle coverage maps—if the Commission persists in requiring them both, it should acknowledge they are separate coverage maps and must have separate challenge processes for each map.

There is a risk that aggregating different coverage maps could result in a false number of failed tests. This could happen if a challenger submits an in-vehicle test when outdoor stationary coverage meets or exceeds the minimum speed available, especially given the inherent variability of in-vehicle testing described above. Aggregation cannot address the many potential variations in in-vehicle tests, such as velocity, direction of travel, the myriad vehicle configurations, etc. The disconnect in the Commission's reasoning between the requirement for separate outdoor and in-vehicle maps while simultaneously proposing to combine the tests for purposes of the challenge underscores the need to reconsider the in-vehicle requirement.

[28] *See id.* ("We acknowledge that stationary tests and in-vehicle mobile tests may not be entirely homogeneous measurements of an on-the-ground experience. However, we believe that aggregating such tests when evaluating challenges would more closely align with the Broadband DATA Act requirement to develop a 'user-friendly' challenge process and would thus outweigh any cost to accuracy in treating such tests as homogeneous.").

[29] *In re Establishing the Digital Opportunity Data Collection*, Third Report and Order, 36 FCC Rcd 1126, 1165 ¶ 98 (2021) ("*Third Report and Order*").

III. THE COMMISSION SHOULD SET APPROPRIATE THRESHOLDS FOR CHALLENGES AND ENSURE THAT SPEED TESTS ARE RELIABLE.

A. T-Mobile Supports Aggregating Challenge Test Data with Appropriate Thresholds.

T-Mobile applauds the Commission's decision to aggregate test data for the mobile challenge process. Aggregating test data will be critical to making the challenge process a useful and manageable tool for improving coverage maps. In the *Third Report and Order*, the Commission recognized that the number of challenges to mobile providers' maps "will be significant" and that the challenge process must be able to "resolve challenges in an efficient manner" and "mitigate the time and expense involved."[30] To meet those objectives, the Commission decided to aggregate speed test results for both consumer challenges and government and third-party challenges.[31]

Aggregation is user-friendly because it does not require consumers to meet certain minimum geographic thresholds or collect large amounts of data—as was required for Mobility Fund Phase II ("MF-II"). In fact, consumers were excluded altogether from the MF-II challenge process because the Commission concluded that individual consumers did not have the "time, ability, or resources" to "acquire the requisite data sufficient to support a valid challenge."[32] Instead, any speed-tests will be aggregated together to assess whether there is any issue with coverage data in a given area.

For the benefits of aggregation to be realized, appropriate thresholds must be set for cognizable challenges. Using temporal, geographic, and numerical thresholds is a reasonable

[30] *Id.* at 1167-68 ¶ 105.

[31] *Id.* at 1167-68, 1173 ¶¶ 105, 120.

[32] *In re Connect America Fund*, Order on Reconsideration and Second Report and Order, 32 FCC Rcd 6282, 6303-04 ¶¶ 42-43 (2017).

way to identify cognizable challenges.[33] However, if these thresholds are not carefully calibrated, providers could end up having to respond to an unmanageable number of challenges or to a significant number of challenges that plainly lack merit. T-Mobile recommends the following regarding the temporal, geographic, and numerical thresholds for the challenge process:

Temporal Threshold. T-Mobile supports the proposal to require at least two speed tests in a given hex be conducted at different times of day and to require that these tests be taken at least four hours apart.[34]

Geographic Threshold. For the reasons discussed above, the Commission should use hex-10 cells for the challenge process to track the resolution of providers' maps more closely. This more fine-grained approach will make it unnecessary to use a system of nested point hexes to ensure a reasonable geographic distribution of test data within a challenged cell. Using smaller cells mitigates the concern that test results will be skewed by clustering tests too close together. T-Mobile also supports the Commission's decision to only accept challenges where the coordinates of the test are within an area depicted as covered by the provider (*i.e.*, the test device is within the magenta square of coverage) within a hex.[35] This would minimize the amount of resources spent adjudicating challenges where squares and hexagons simply do not align perfectly.

Numerical Threshold. T-Mobile recommends adjudicating challenges based on a threshold number and percentage of "negative" tests (*i.e.*, tests in which challengers failed to achieve coverage at reported speeds), with providers given the opportunity and as much

[33] Public Notice ¶ 11.

[34] *Id.* ¶ 12.

[35] *See id.* ¶¶ 11-12, Appendix at 36.

flexibility to determine the best way to respond to show that coverage is available as reported. Setting appropriate requirements for test results is the clearest way to resolve challenges and to ensure that coverage is available 90% of the time, as required by the Commission's parameters. Instead of relying on a complicated system of point hexes, the Commission should simply require that challengers submit a minimum of 5 tests for each hex-10 cell, and that at least 50% of these tests are negative.

With these refinements, the proposed challenge process could set the appropriate thresholds to take full advantage of the benefits of aggregation.

Finally, the Public Notice proposes to notify a provider about any challenged hexagons at the end of each calendar month.[36] Batching out challenges in regular intervals will make the overall process more orderly and much easier for providers to manage. T-Mobile supports this proposal.

B. The Commission Must Ensure that Any Approved Speed Test Applications, Including the FCC Speed Test, Meet the Same Robust Standards.

The Commission proposes that speed test applications be the primary tool used to challenge the accuracy of mobile wireless coverage maps.[37] If these applications are unable to collect the required information and/or are not sufficiently robust, they may be unable to deliver accurate or reliable data for challenges. Congress, too, recognized the need for robust speed tests and directed the Commission to rely on applications that are "highly reliable" and "have proven methodologies for determining [mobile broadband] network coverage and network performance."[38] Adopting uniform standards for all speed test applications, including the FCC

[36] *Id.* ¶ 16.

[37] *Id.* ¶ 14.

[38] 47 U.S.C. § 644(b)(2)(A).

Speed Test application, will simplify the process, should minimize negative tests due to software and human errors, and will in turn make the challenge process more effective and easier to administer.

Notice and Comment for All Speed Test Applications. T-Mobile supports the Commission's proposal to require notice and comment before any speed test application, including the FCC Speed Test application, is approved.[39] As part of the notice-and-comment process, the Commission should allow commenters to review an application's source code (subject to any appropriate protective orders). Making the source code transparent is the best way to identify software issues that could skew the results of speed tests.

Criteria for Speed Test Applications. The Commission should require that all approved speed test applications collect data using a sufficient number of servers to support a large volume of challenges distributed across the country without skewing results.

The Commission also needs to adopt standards to ensure that speed test applications are themselves reliable and user friendly. In particular, the Commission should set minimum standards to filter out speed test applications with known shortcomings. For instance, Commission-approved speed test applications should use a minimum number of servers. The number of servers these applications use can be highly variable. Ookla, for example, uses over 1,000 servers, whereas the FCC Speed Test application uses approximately 10. Having too few servers can lead to unreliable test results, and basing challenges on speed test applications using wildly different amounts of servers can lead to confusion. T-Mobile recommends that all speed test applications used for the challenge process be required to use a minimum of 50 servers geographically spread out across the country. These additional parameters will ensure that only

[39] Public Notice ¶ 54.

the most reliable applications are used to make changes to providers' coverage data, which will reduce the burdens of the challenge process on all parties concerned and help make coverage maps more accurate.

To reduce consumer confusion about where coverage is available, the Commission should require any other approved speed test applications, including the FCC Speed Test application, to show whether a provider's map reports coverage as being available (and if so, at what speeds) at the user's location. Using the geographic coordinates of the test devices, any speed test application used in the challenge process should be able to tell challengers whether a test taken in that location will be relevant at all to a given provider's map. The speed test would also permit users to toggle between different providers' maps to assess whether another provider reports coverage in the location. For example, if T-Mobile does not report 5G coverage as being available in a certain location, an approved speed test application should identify coverage does not exist so the challenger is aware that a challenge would not be valid at that location. This would help to inform consumers so that they target speed tests to areas with reported coverage and would minimize the potential for these areas to be considered false positives.

With sufficient safeguards in place to ensure highly reliable speed-test data—as Congress intended—the Commission should also ensure the process for submitting and responding to challengers is user friendly. To that end, T-Mobile recommends that the Commission make the challenge portal compatible with widely used database software like Salesforce. This will allow providers to track challenges more easily, which will in turn make the challenge process more efficient overall.

IV. PROVIDERS SHOULD HAVE MAXIMUM FLEXIBILITY TO DETERMINE HOW TO RESPOND TO CHALLENGES.

The Commission concluded in the *Third Report and Order* "that adopting a flexible approach for responding to challenges will help mitigate the time and expense involved and encourage prompt resolution in accordance with the requirements of the Broadband DATA Act."[40] In so finding, the Commission correctly recognized that mobile providers should be allowed to submit data from alternative sources to rebut challenges, including drive testing conducted in the ordinary course of business, testing data from third parties like Ookla, and transmitter monitoring software.[41] The challenge process must adopt rules that embrace this flexibility.

Use of Speed Test Applications. T-Mobile supports the proposal to let mobile providers use any Commission-approved speed test application to collect on-the-ground data to rebut a challenge.[42] The Commission should ensure that speed test applications used to challenge coverage maps can also be used to respond to challenges. For example, use of the FCC Speed Test application, if approved by the Commission, could be a way to rebut challenges because it has the capacity to streamline the process and allow for a clear apples-to-apples comparison of test data.[43]

In addition, mobile wireless providers should be permitted to submit speed-test data from third-party applications, such as Ookla's speed test application. The Commission has recognized Ookla's role in creating "the most reliable and comprehensive available data that is currently

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[40] *Third Report and Order*, 36 FCC Rcd at 1169 ¶ 109.

[41] *Id.* at 1170 ¶ 110.

[42] *See* Public Notice ¶ 17.

[43] The Commission has delegated to OET the authority "to update the FCC Speed Test app as necessary . . . [to] include the requisite functionalities so that challengers may use it in the challenge process." *See id.* ¶ 54.

available on the extent of mobile coverage,"[44] so reliance on data from Ookla's application, or other approved applications, for rebuttal is warranted. Finally, the Commission should create an online portal for providers to submit rebuttal data derived from these sources.

On-the-Ground Testing. Mobile wireless providers should also be permitted—but not required—to submit data from coverage tests conducted in the ordinary course of business or any other federal or state required coverage tests. For example, as part of its merger with Sprint, T-Mobile has committed to conducting coverage tests to verify its 5G deployment obligations, using specifications set by the Commission.[45] While the Public Notice acknowledges that this information may be submitted "voluntarily,"[46] it is important to recognize the value that such data represents both in conjunction with other submissions *and* on its own. These tests are as—if not more—reliable than the *ad hoc* on-the-ground testing providers might otherwise conduct in response to a challenge, and the Commission should give them the same weight in the challenge process. To that end, if the results of a drive test are conducted within 12 months of a submitted challenge, that evidence should be sufficient to show that coverage is available in a given area and rebut a challenge to the contrary. Accepting this carrier testing data will significantly increase the efficiency of the challenge process and save mobile providers a substantial amount of time and resources in responding to challenges, which is consistent with the Broadband DATA Act's directive.

[44] *See In re Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion*, 2020 Broadband Deployment Report, 35 FCC Rcd 8986, 9001-02 ¶ 33 (2020).

[45] *In re Applications of T-Mobile US, Inc. and Sprint Corp. for Consent to Transfer Control of Licenses and Authorizations*, Memorandum Opinion and Order, Declaratory Ruling, and Order of Proposed Modification, 34 FCC Rcd 10578, 10590, 10698 ¶¶ 31, 273 (2019) ("*T-Mobile/Sprint Merger Order*").

[46] *See* Public Notice ¶ 24.

Mobile Wireless Providers' Own Software Tools. Providers should be allowed to use their own software tools to rebut challenges, without seeking prior Commission approval for the use of such applications. The Public Notice indicates that staff will add these data sources to the list of acceptable alternatives if they are "found to be sufficiently reliable."[47] A tool that is used in the ordinary course by the mobile provider for speed-testing purposes or network performance monitoring meets this standard, as they generally include carrier-specific transmission monitoring software to ensure optimal cellular operations, which can be easily used to validate available speeds. To the extent the Commission concludes that specific approval must be required, mobile providers should have the opportunity to submit their tools to OET for approval, and OET should commit to evaluate and approve or reject the use of these tools within 90 days of submission.

Identification of Other Issues. Beyond infrastructure data, providers should also be able to respond with *any* appropriate data showing that the challenge test results are invalid due to issues with the test devices used. For example, providers should be able to rebut challenges by showing that the devices used for testing were not compatible with the technology relevant to the provider's map or the provider's spectrum. Providers should also be able to rebut a challenge on the grounds that test devices used data plans that were not capable of receiving the advertised speeds in the relevant area at the time of test. Similarly, T-Mobile supports allowing providers to submit limited amounts of infrastructure data where appropriate to show that negative test results were due to issues like temporary outages at a cell site.[48]

[47] *Id.* ¶ 24.

[48] *Id.* ¶ 20. Of course, the Commission does not need to collect infrastructure information not necessary to confirm a temporary outage given the availability of other data (including NORS reports) that serves the same purpose.

Moreover, providers should be able to explain that a challenge is invalid because it is based on stale data. The Public Notice seems to limit challenges to test data conducted during the six-month window between BDC filings.[49] The Commission should, however, adopt a narrower window to ensure that only the *best* data available is used to call a provider's map into question. With a six-month framework, data collection at the beginning of the period may no longer reflect the current on-the-ground realities. T-Mobile is constantly updating its highly dynamic network to keep pace with network demand and data usage patterns. Because of these regular and consistent changes to the network, speed-test results can easily become stale within a matter of weeks—or even days—depending on the circumstances.

To ensure that a mobile provider can appropriately replicate and respond to any changes, the Commission should adopt a 90-day "expiration" date for challenge data and ensure that providers have access to the test dates for all underlying tests forming the basis of a challenge. This will ensure that mobile providers are able to focus their rebuttals on the most relevant challenges. Test data that is past its expiration date for the challenge process could still be used for the Commission's crowdsourced data efforts,[50] given the anticipated volume of data points that will be collected through that process, so long as the data was collected within the last 6 months.

V. REQUESTS FOR VERIFICATION DATA SHOULD BE TARGETED AND LIMITED.

The Commission placed certain limits on the Bureaus' authority to request and collect data for verification purposes. In particular, the Commission provided that the Bureaus may

[49] *See id.* ¶ 18. ("We propose that any areas where the provider has demonstrated sufficient coverage would be ineligible for subsequent challenge until the first biannual BDC coverage data filing six months after the later of either the end of the 60-day response period or the resolution of the challenge.").

[50] *See id.* ¶¶ 51-59.

request and collect data to ensure that the coverage data in the BDC are as credible and reliable as possible, but they may do so "on a case-by-case basis where staff have a credible basis for verifying the provider's coverage data."[51] Consistent with the Commission's direction, there should be clear standards in place for determining when a "credible basis" exists.

Setting clear standards to limit the scope and frequency of such requests will ensure that the requests for verification data are made on a case-by-case basis and only when there is an actual need for additional data. The Public Notice proposes that verification requests would be made "based upon all available evidence, including submitted speed-test data, infrastructure data, crowdsourced and other third-party data, as well as staff evaluation and knowledge of submitted coverage data (including maps, link budget parameters, and other credible information)," and the Public Notice seeks comment on any alternative methodologies for determining where staff have a credible basis for verifying a mobile provider's coverage data.[52] Although the Public Notice identifies certain information that staff may review, it does not set forth any framework for *making* the determination that there is a "credible basis" for the request.

A. The Commission Should Not Create Its Own, Separate Propagation Maps.

The Public Notice seeks comment on ways that infrastructure data could be used, including as data for the Commission to conduct its own modeling of a provider's coverage.[53] Under the proposal, the Commission would model mobile wireless coverage "using the data submitted by the provider including link budget parameters, cell-site infrastructure data, and the information provided by service providers about the types of propagation models they used,

[51] *Id.* ¶ 26; *see also Third Report and Order*, 36 FCC Rcd at 1146-47 ¶ 50.

[52] Public Notice ¶ 27.

[53] *Id.* ¶ 21.

standard terrain and clutter data, as well as standard propagation models, to determine whether the provider should be required to update its maps."[54]

As an initial matter, collecting all of the infrastructure information needed for a propagation model is not only in tension with the Commission's direction to require the information on a targeted case-by-case-basis, but the information is highly sensitive and proprietary as the Commission has recognized.[55] Beyond those concerns, T-Mobile urges the Commission not to conduct its own propagation modeling, as this would be a highly inefficient use of resources for both the FCC and providers and only lead to disparate coverage maps and endless recursive dialog about what is the appropriate way to perform coverage modeling. For several reasons, an alternative propagation model would not be illuminating for the Commission or a reliable basis for questioning the accuracy of a provider's maps.

First, propagation modeling is a highly complex task, particularly for nationwide networks like T-Mobile's. It is also inherently probabilistic, since the propagation of signal in an area is affected by a variety of different factors. As the Commission has previously explained, "many factors can affect a user's experience, making it difficult to develop a coverage map that provides the exact mobile coverage and speed that a consumer experiences."[56] Even if the Commission's model would yield different coverage predictions than a provider's model, there is no reliable basis for inferring that this is due to an error in the provider's model, as opposed to differing assumptions about the wide range of factors that can affect coverage.

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[54] *Id.* ¶ 21.

[55] *Third Report and Order*, 36 FCC Rcd at 1148-49 ¶ 55.

[56] *In re Establishing the Digital Opportunity Data Collection*, Report and Order and Second Further Notice of Proposed Rulemaking, 34 FCC Rcd 7505, 7549 ¶ 112 (2019).

Second, T-Mobile is constantly updating and optimizing its network to keep pace with demand and provide consistently high-quality coverage. For example, T-Mobile's engineers routinely make adjustments to power levels, antenna direction and tilting, load sharing techniques and parameters for distributing network traffic, hardware upgrades, and handover threshold changes to further reduce Signal to Interference & Noise Ratio to improve performance. Because T-Mobile's network is so dynamic, a propagation is really a snapshot in time. Constructing an alternative model of T-Mobile's network would result in a dated snapshot at best, not T-Mobile's network. Ultimately, an endless back and forth dialog will ensue between Commission and provider engineers about the proper way to conduct the modeling.

Third, it is not possible for the Commission to conduct its own propagation model of T-Mobile's network because modeling a provider's coverage is not a simple matter of plugging infrastructure inputs into a model. T-Mobile spends millions of dollars each year to create, and fine-tune its propagation models using dedicated full-time engineering staff. That is on top of the many years T-Mobile's network engineers have spent calibrating the model using continuous wave testing, collecting data about buildings and clutter in T-Mobile's service area, and developing expertise and familiarity with T-Mobile's network more generally. This is a time-consuming and expensive process that takes years of effort to do in a rigorous way. It is not feasible for the Commission to replicate T-Mobile's coverage maps.

In addition to being costly and time-consuming, it is not a good use of resources. There is no need for the Commission to construct its own models of a provider's coverage. The Commission's rules already ensure that a variety of processes are available to fine-tune providers' coverage maps. To the extent the staff wish to evaluate the assumptions and predictions that go into a provider's coverage maps, the Commission will already be collecting

mobile providers' link budgets for that purpose. For all of these reasons, the Commission should not use their limited resources to perform their own modeling.

B. Requests for Verification Data Should Be Geographically Targeted and Time Limited.

In establishing standards for the collection of verification data, the Commission should ensure that requests are (1) targeted to the smallest area needed to resolve the coverage issue; (2) focused on more sparsely populated areas of the country, where maps may be used for universal service funding decisions; and (3) not issued to providers who are already subject to mandatory coverage testing.

First, verification requests should be targeted to the smallest geographic area necessary to resolve the coverage issue the Commission has identified. It is highly burdensome for a provider to conduct on-the-ground testing of a large portion of its service area, and collecting information on all cell sites and antennas in a large area would heighten concerns about protecting the competitive sensitivity of this information and the security of cell sites. Targeting requests in this way will reduce the burden of collection and limit collection of proprietary data that the Commission has recognized to be highly sensitive.[57]

Second, verification requests should be focused on more sparsely populated areas of the country. Prioritizing rural, less populated areas will also help support public policy initiatives. Because the Broadband DATA Act requires the Commission to use the maps for funding decisions, ensuring accurate maps in these areas should be a priority.[58]

Third, providers that are already subject to any Commission mandatory coverage testing should be exempt from verification requests. As mentioned above, T-Mobile has committed to

[57] *Third Report and Order*, 36 FCC Rcd at 1148-49 ¶ 55.

[58] 47 U.S.C. § 642(c)(2).

conducting substantial drive tests to verify its 5G deployment obligations, using specifications set by the Commission.[59] In situations like these, the Commission will already have sufficient verification of a provider's coverage maps and ample assurance that the provider's maps are generally reliable. Indeed, the Commission found in the T-Mobile/Sprint merger that the mandated drive tests were sufficient to confirm T-Mobile's coverage.[60] Providers should therefore be exempt from verification requests so long as they are subject to mandatory testing.

C. Mobile Wireless Providers Should Be Given Ample Time and Flexibility to Respond to Information Requests.

The Public Notice proposes that a mobile provider's response to a verification request, which must be submitted within 60 days of notification of the request, must cover a "statistically valid sample" of the targeted area, whether in the form of on-the-ground test data, infrastructure data, or other types of data that the provider believes to support its reported coverage.[61] Providers should be given more time to respond to staff requests where appropriate. As a practical matter, when on-the-ground testing is needed to verify coverage data, providers will need much more than 60 days to perform the necessary testing. At a minimum, providers should be given six months to complete their response to a staff request when they elect to submit (or are requested to submit) on-the-ground testing data.

Furthermore, the Commission should set some reasonable limitations on the amount of verifications that can be requested from a provider in a given reporting period. T-Mobile submits that it would be unduly burdensome and counterproductive to require a provider to submit verification data for more than 10,000 square miles of its service area in a given year. In

[59] *T-Mobile/Sprint Merger Order*, 34 FCC Rcd at 10590, 10698 ¶¶ 31, 273.

[60] *See id.* at 10698 ¶ 273.

[61] *Third Report and Order*, 36 FCC Rcd at 1150 ¶ 59; Public Notice ¶¶ 26, 28.

addition, for the reasons discussed above, providers should be allowed to submit data from alternative sources to satisfy verification information requests, including data from their own software tools (*e.g.*, transmitter monitoring software). This flexibility would allow providers sufficient time to produce the data requested and place a reasonable limit on the data requests' burden on providers.

VI. THE PROPOSED COLLECTION AND USE OF CROWDSOURCED DATA IS REASONABLE AND SHOULD BE USED FOR THE CHALLENGE PROCESS.

The Public Notice seeks comment on several proposals regarding the collection and use of crowdsourced data, including making certain speed test metrics optional for crowdsourced data.[62] T-Mobile supports these proposals because they are tailored and will serve to limit burdens on providers without compromising the need for the Commission to ensure that it receives verified and reliable data. In particular, T-Mobile supports the proposal to initiate an inquiry only when a "critical mass" of this crowdsourced data "suggest[s] that a provider has submitted inaccurate or incomplete data."[63] This approach strikes the right balance between the need for verification and the need to limit burdens on providers, and T-Mobile respectfully submits that this "critical mass" approach should be used for aggregating challenge data and for issuing verification requests as well.

The Public Notice proposes to require that government entities and third parties wishing to submit their own test data use the same metrics and parameters as mobile providers.[64] The Commission proposes that this data could then be used to verify coverage maps and would be treated as crowdsourced data, and that "assigning consistent, standardized procedures for

[62] Public Notice ¶ 53.

[63] *Id.* ¶ 53.

[64] *Id.* ¶ 44.

governmental entities and third parties to submit on-the-ground data will be both appropriate and necessary to ensure the broadband availability maps are as accurate and precise as possible."[65] T-Mobile supports this approach, as there is no reasonable basis for holding government entities or third parties to a lesser standard when it comes to on-the-ground testing data.

VII. CONCLUSION

T-Mobile supports the Commission's ongoing efforts to update its mobile wireless coverage maps. Effective processes for verifying coverage data will play a critical role, and T-Mobile encourages the Commission to implement the recommendations discussed above to help improve the accuracy of coverage maps without imposing unnecessary burdens on challengers or providers.

Respectfully submitted,

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[65] *Id.* ¶¶ 44-45.